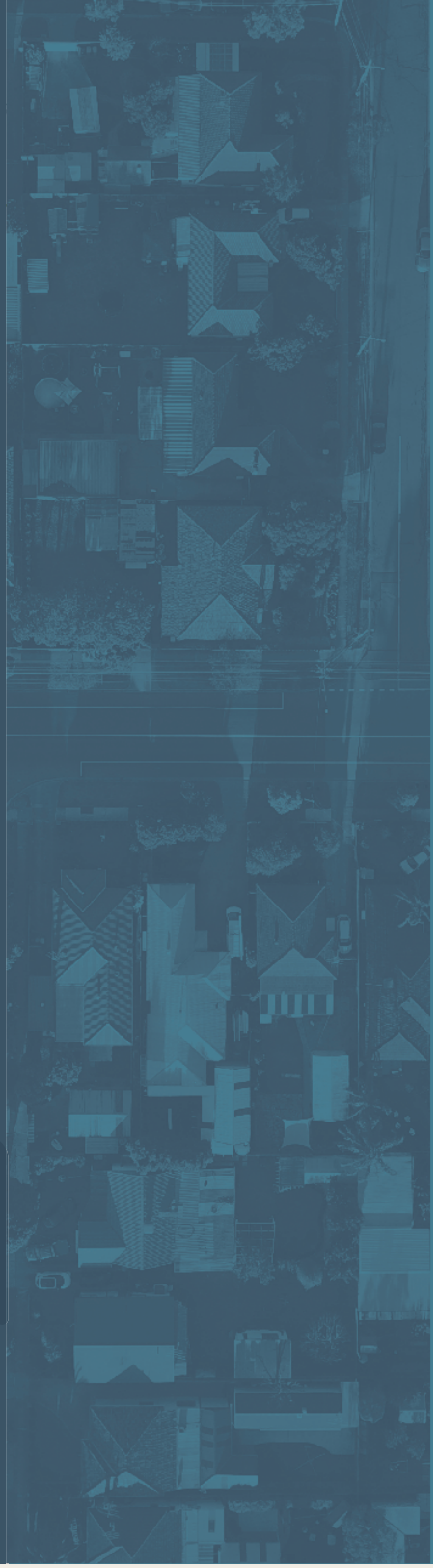
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Ipswich City Council

April 2022

Storm Tide and Erosion Prone Area Hazard Identification and Risk Assessment



REPORT

Meridian Urban

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

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REVISION SCHEDULE

Rev No.	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
A	**April 2022**	**Draft report**	**UK**	**KK**	**KK**	**SD**
B	**April 2022**	**Final Report**	**UK**	**KK**	**KK**	**SD**

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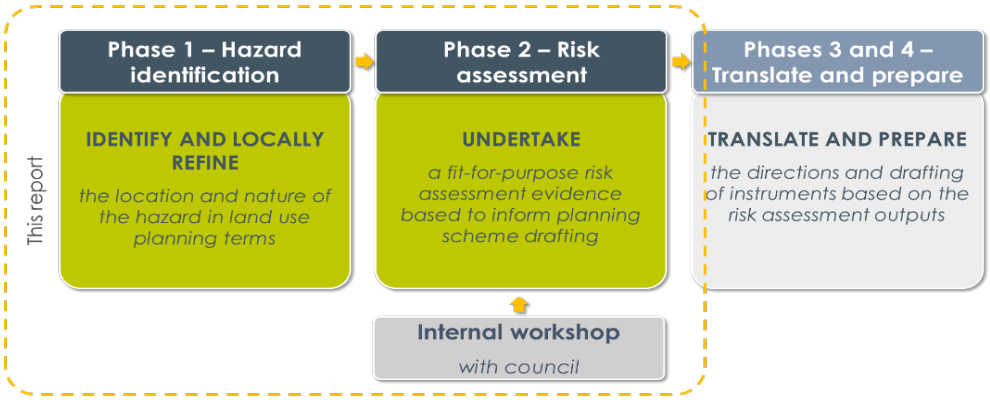
The client acknowledges and agrees that Meridian Urban has not created or contributed to the creation or existence of this hazard and the Client indemnifies Meridian Urban for claims arising out of or resulting from erosion and/or storm tide inundation except to the extent attributable to the negligence of Meridian Urban.

The Client agrees that the Consultant shall have no liability in respect of any damage or loss incurred as a result of erosion and/or storm tide inundation.

Executive Summary

Meridian Urban together with Water Technology, has been engaged by Ipswich City Council to deliver the natural hazard risk assessments for the storm tide inundation and erosion prone area to inform the preparation of the new Ipswich planning scheme.

This report provides an overview of coastal hazard exposure across the Ipswich Local Government Area using available erosion prone area and storm tide inundation area State mapping. Specifically, this report addresses phases 1 and 2 below:



A high-level risk assessment in line with the State Planning Policy guidance on coastal hazards and QCoast 2100 Minimum Standards and Guidelines was undertaken. The assessment reveals that the exposure is limited to the fringes of properties that line the Brisbane and Bremer Rivers.

The dominant source of inundation hazard is likely to be from riverine flooding. Therefore, storm tide inundation risk is not considered significant to evoke a dedicated land use planning response. The focus of the exposure analysis is therefore predominantly on the erosion prone area, as the land mapped within this category is assumed to be lost should it be exposed to an erosion event. The following recommendations are provided to inform the planning response and preparation of drafting recommendations for the new Ipswich planning scheme:

- Land use policy or zoning changes are not considered necessary based on the levels of risk presented by either storm tide or erosion prone areas, other than for two properties identified at intolerable risk in Local Area Framework 10 – Karalee, Barellan Point and Chuwar;
- Council notes that the State interest policy 8 on Erosion prone areas within a coastal management district limits development unless the development cannot feasibly be located elsewhere and is minor redevelopment of an existing permanent building or structure that cannot be relocated or abandoned;
- Council be cognisant that if their new planning scheme maps storm tide inundation areas, then the building work MP3.5 trigger will no longer apply to those parts of the flood hazard area that are also then identified in the storm tide inundation area. This is because MP 3.5, which regulates the design and construction of buildings in designated flood hazard areas, does not apply on land subject to storm surge;
- As riverine flooding is the highly dominant hazard over storm tide inundation, it is not recommended that storm tide inundation be mapped within the planning scheme. This will also ensure no unintended conflict with the operation of the MP3.5 trigger; and
- Erosion prone areas should still be mapped within the planning scheme (using the state layer) and development controls that achieve the relevant state interest policies of the State Planning Policy should be included in a related overlay code, such as the flood hazard overlay code or the watercourses and wetlands overlay code. This will strengthen the policy position of limiting development close to the waterway, given the requirement for only temporary or relocatable development within the erosion prone area.

Ipswich City Council

Storm Tide and Erosion Prone Area – Hazard Identification and Risk Assessment

CONTENTS

1 Introduction 1
1.1 Purpose 1
1.2 Application 1
1.3 Intended outcomes 1
2 Ipswich Local Government Area overview 2
2.1 Local Government Area context 2
2.2 Major catchments 3
2.3 Storm tide and erosion prone area 3
3 Storm tide and erosion prone area policy context 5
3.1 Storm tide and erosion prone area defined 5
3.2 State Planning Policy 7
3.3 SPP guideline – Integrating state interests in a planning scheme 8
4 Phase 1 – Hazard identification 10
5 Phase 2 – Risk assessment 14
5.1 Exposure analysis and risk assessment 14
5.1.1 Exposure by area 15
5.1.2 Land use activity 16
5.1.3 Building footprints 17
5.1.4 Risk statement 19
5.2 Policy and risk synthesis 21
6 Recommendations 22

LIST OF TABLES

Table 3-1. Relevant State interest policies 7
Table 5-1. Risk evaluation categories 14
Table 5-2 Exposure by mapped area (km²) 15
Table 5-3 Exposure by Land Use Activity (properties) 16
Table 5-4 Exposure by building footprint 18
Table 5-5 Risk matrix 19
Table 5-6 High level risk assessment of exposed buildings 20

LIST OF FIGURES

Figure 1. Overarching project phases 1
Figure 2. Map of the Ipswich LGA *(Source: Ipswich City Council, 2021)* 2
Figure 3. Major catchments within the Ipswich LGA *(Source: IICP, 2021* 3
Figure 4. SPP Interactive Map - Erosion prone area and storm tide inundation area for Ipswich LGA 4
Figure 5. Storm tide (medium hazard) within the Ipswich LGA 11
Figure 6. Storm tide (high hazard) within the Ipswich LGA 12
Figure 7. Erosion prone area within the Ipswich LGA 13
Figure 8. Erosion Prone Area in Local Area Framework 10 – Karalee, Barellan Point, Chuwar 16
Figure 9. Building footprint exposure (% of footprint in mapped erosion prone area (EPA)) 18
Figure 10. Local Area Framework 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket: Building footprint in mapped erosion prone area 19

1 Introduction

1.1 Purpose

Meridian Urban, together with Water technology, has been engaged by Ipswich City Council (Council) to deliver the natural hazard risk assessments for the storm tide and erosion prone area to inform the preparation of the new Ipswich planning scheme.

The purpose of this report is to provide the technical evidence from the storm tide and erosion prone hazard identification and risk assessment.

Council is embarking upon the preparation of a new planning scheme to replace the current Ipswich planning scheme which was prepared under the now repealed *Integrated Planning Act 1997* and came into force and effect in 2004.

1.2 Application

This evidence report provides the technical evidence to inform the development of an overlay and code provisions for the new planning scheme to manage development on land exposed to storm tide inundation and/or coastal erosion, which satisfies the requirements of the State Planning Policy (SPP).

1.3 Intended outcomes

This report will:

- **Phase 1 – Hazard identification**
  identify and locally refine the location and nature of the hazard in land use planning terms; and
- **Phase 2 – Storm tide and erosion prone area risk assessment**
  undertake a storm tide and erosion prone area fit-for-purpose risk assessment evidence base to inform the development of land use planning policy and scheme drafting for the new planning scheme.

The following phases are provided for this work, shown in **Figure 1**.

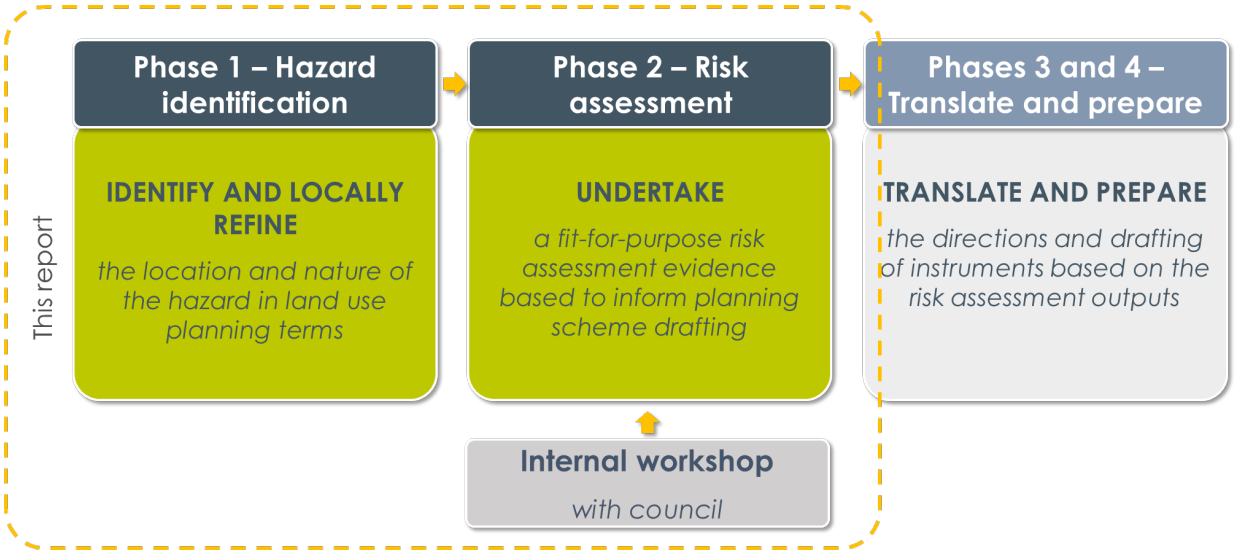


Figure 1. Overarching project phases

2 Ipswich Local Government Area overview

2.1 Local Government Area context

The Ipswich Local Government Area (LGA) is located within South East Queensland, approximately 40 kilometres south west of Brisbane. The LGA encompasses the City of Ipswich, the oldest provincial city in Queensland. The City of Ipswich and the surrounding urban areas are among the fastest growing urban areas within Queensland.

The LGA spans an area of 1,085 square kilometres and is bound by Brisbane and Logan City local government areas to the east, Scenic Rim LGA to the south, Lockyer Valley LGA to the west and Somerset LGA to the north.

The LGA is heavily urbanised in the east, surrounding the City of Ipswich and including the significant growth areas of Ripley Valley and Springfield. To the west, the LGA encompasses rural, agricultural and specialised uses as well as some small townships including Walloon, Rosewood, Grandchester and Willowbank.

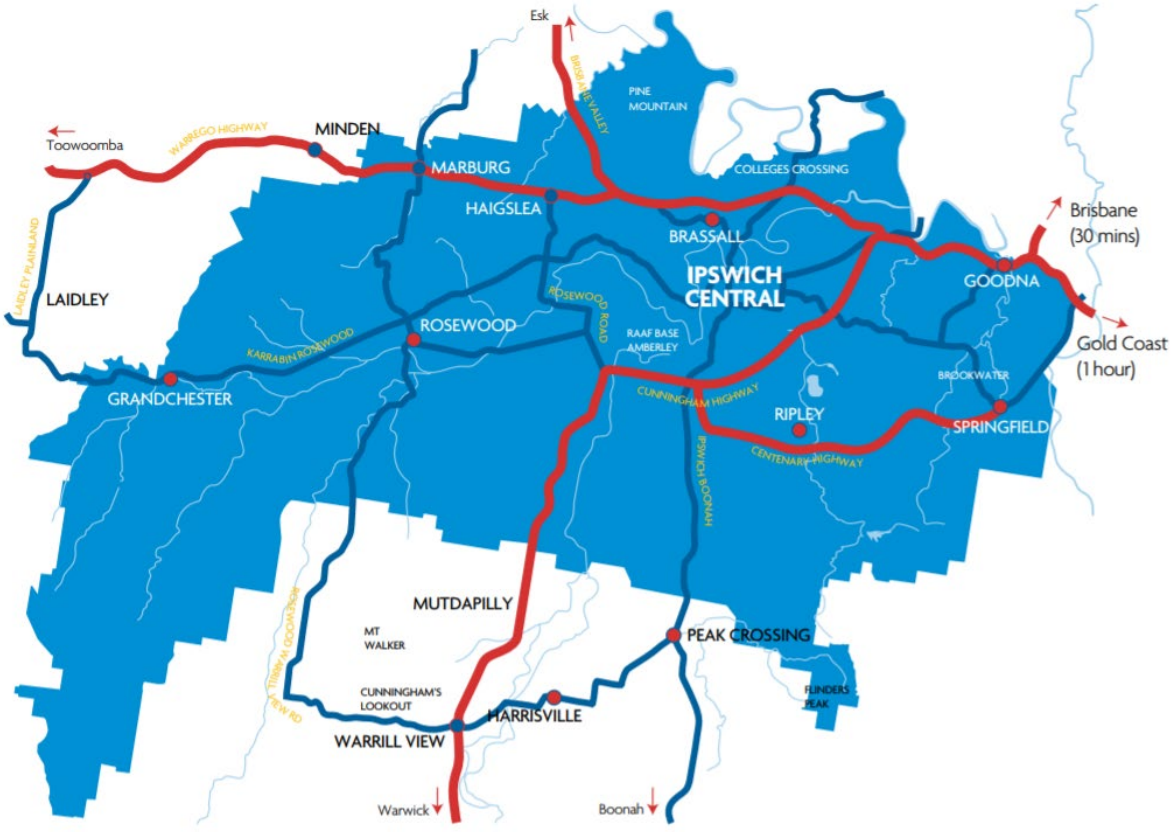


Figure 2. Map of the Ipswich LGA *(Source: Ipswich City Council, 2021)*

Land uses within the urbanised eastern part of the LGA include higher density commercial uses within the Ipswich CBD surrounded by residential areas consisting of predominately low density, detached housing. Industrial areas of Carole Park and Redbank include large warehouse and logistic activities. Additionally, waste and recycling facilities are located at New Chum and Swanbank.

Land uses within rural and agricultural areas incorporate primary production activities including horticulture, grazing, orchards, poultry farms hobby farms as well as rural and rural residential communities. Some quarries and other extractive industries are also located within the LGA.

There are a total of 72,738 private residential dwellings within the LGA with an average household size of 2.8 people per household. This is marginally higher than the state average of 2.6 people per household.

There are a number of regionally significant facilities within the LGA including:

- RAAF Base Amberley;
- Ipswich Motorsport Precinct;
- Borallon Correctional Centre.

2.2 Major catchments

The Ipswich LGA sits predominantly within the Bremer River Catchment. Major tributaries of the Bremer River include Warrill Creek, Western Creek, Franklin Vale Creek, Reynolds Creek, Purga Creek and Bundamba Creek. The Brisbane River Catchment also forms part of the Ipswich LGA affecting the north eastern suburbs, as well as the headwaters of the Lockyer Creek (**Figure 3**).

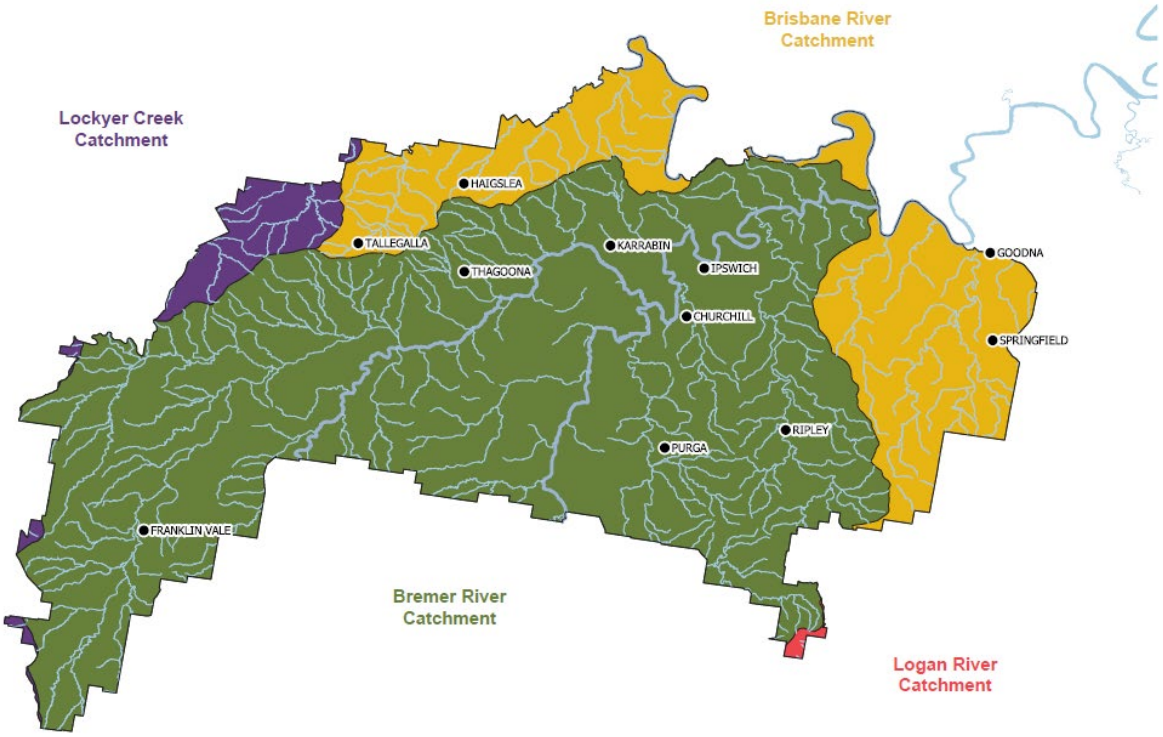


Figure 3. Major catchments within the Ipswich LGA *(Source: IICP, 2021*

2.3 Storm tide and erosion prone area

According to the SPP interactive mapping system, high and medium storm tide inundation area and erosion prone is identified along the Bremer River, as seen in **Figure 4**. The hazard is therefore evident in the eastern suburbs of Ipswich including: Barellan Point, Karalee, Bundamba, North Tivoli, North Booval, Moores Pocket, East Ipswich, Basin Pocket, Tivoli, Raymonds Hill, Brassall, Woodend, Coalfalls, Sadliers Crossing and West Ipswich.

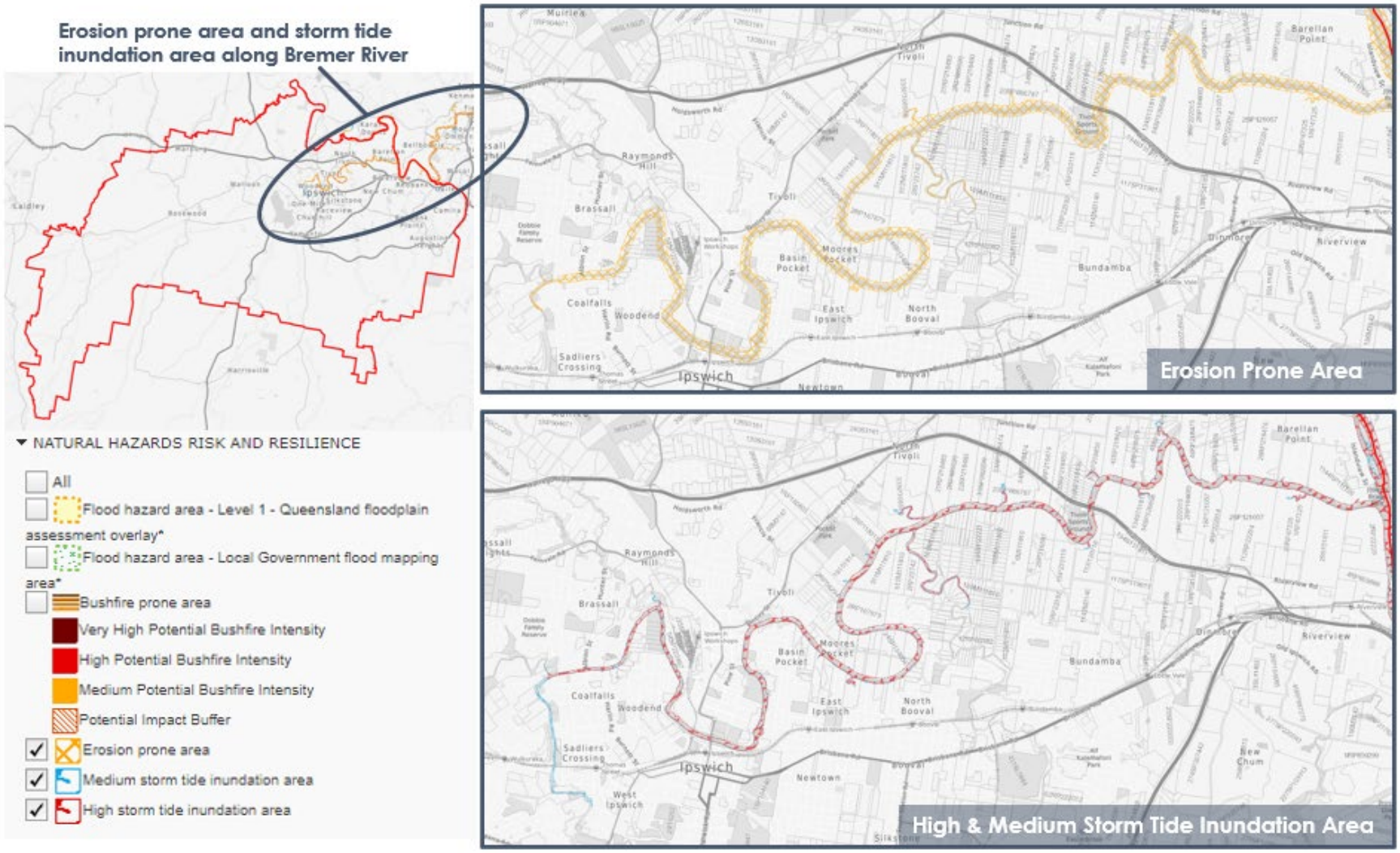


Figure 4. SPP Interactive Map - Erosion prone area and storm tide inundation area for Ipswich LGA

3 Storm tide and erosion prone area policy context

3.1 Storm tide and erosion prone area defined

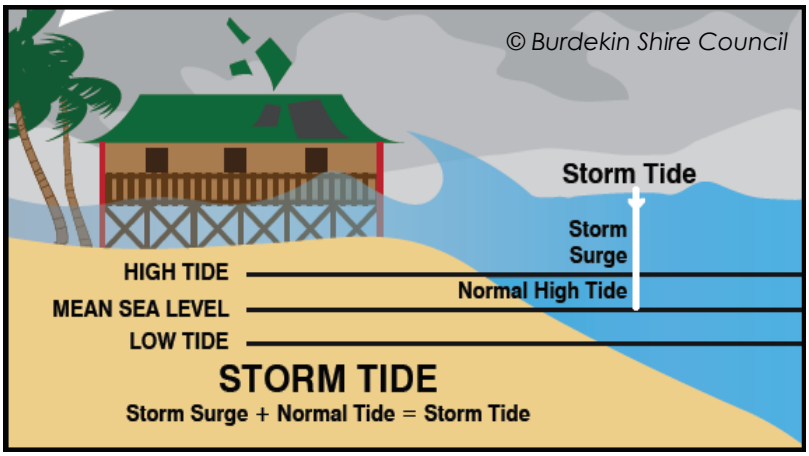
A natural hazard is a naturally occurring event that may cause harm to people, damage to property and infrastructure, and impact our economy and the environment. Taking appropriate account of the potential impacts of natural hazards through effective land use planning and development decisions can significantly reduce the likelihood and severity of impacts of certain natural hazards including storm tide inundation and coastal erosion.

The effects of climate change are projected to impact on the extent, frequency and intensity of natural hazards. For example, projected sea level rises will increase the extent of coastal hazards, progressively cause the permanent inundation of low lying land and extend the risk of storm tide inundation to new areas.

Storm tide inundation

As per the Queensland State Government definition:

A storm tide occurs when water levels are elevated well above normal tidal levels during a severe storm event. This can cause the inundation of low-lying land on the coast, resulting in damage to the natural and built environments.



The defined storm tide event level adopted for identifying and planning for storm tide inundation is the 1% annual exceedance probability (AEP) storm tide, equivalent to 1-in-100 average recurrence interval (ARI). The SPP IMS storm tide inundation area mapping is based on regional default water levels of 1.5 metres above the highest astronomical tide (HAT) for South East Queensland (SEQ) and 2.0 metres HAT for the remainder of Queensland.

A storm tide inundation area is classified as either:

- high hazard area—refers to the land within the coastal hazard area that would be subject to temporary inundation during a defined storm-tide event of one metre or more; or
- medium hazard area—refers to land within the coastal hazard area that would be subject to less than one metre of inundation during a defined storm-tide event.

Erosion prone area

The erosion prone area is the width of the coast that is considered to be vulnerable to coastal erosion and permanent inundation by the sea over a nominated 100-year planning period. It includes:

- erosion due to storm impact and long-term trends including sediment supply deficit and channel migration; and
- permanent inundation due to sea level rise.

Erosion Prone Area mapping has been declared for all coastal local government areas in Queensland to regulate development in coastal areas and guide land use planning decisions. The SPP IMS Erosion Prone Area mapping is a representation of the declared erosion prone area

plans for the coastline and covers the entire coast. It is recognised that this mapping is a snapshot in time – the actual erosion prone area location may change over time as the coast erodes and builds up, and more recent information may allow the erosion prone area to be better mapped.

The Erosion Prone Area mapping includes all land considered to be vulnerable to effects of coastal erosion, which is land subject to inundation by tidal waters and permanent inundation due to sea level rise by 2100. The calculation of the erosion prone area is based on the following parameters:

- sea level rise of 0.8 square metres;
- short-term erosion component from extreme storm events;
- long-term erosion component where gradual erosion is occurring commonly from channel migration or a sediment supply deficit;
- dune scarp component to allow for slumping of the erosion scarp;
- permanent inundation of land by tidal water due to sea level rise and the morphological response of the coast to elevated water level; and
- 40 per cent safety factor as per current engineering practices to account for uncertainties and limitations.

Specifically, in accordance with the *Coastal hazard technical guide – Determining coastal hazard areas, 2013*, the landward boundary of land adjacent to coastal waters which is considered to be the erosion prone area is defined by whichever of the following methods give the greater erosion prone area width:

1. *Erosion prone areas that exist over all tidal water to the extent of Queensland coastal waters and on all land adjacent to tidal water.*
2. *Erosion prone areas include areas subject to inundation by the HAT by the year 2100 or at risk from sea erosion;*
3. *On land adjacent to tidal water the landward boundary of the erosion prone area is defined by whichever of the following methods gives the greater erosion prone area width:*

    a. a line measured 40 metres landward of the plan position of the present day HAT level except where approved revetments exist in which case the line is measured 10 metres landward of the upper seaward edge of the revetment, irrespective of the presence of outcropping bedrock;

    b. a line located by the Erosion Prone Area Width Assessment Formula and measured, unless specified otherwise, inland from:

        i. the seaward toe of the frontal due (the seaward toe of the frontal dune is normally approximately by the seaward limit of terrestrial vegetation or, where this cannot be determine, the level of present day HAT); or

        ii. a straight line drawn across the mouth of a waterway between the alignment of the seaward toe of the frontal dune on either side of the mouth; or

    c. the plan position of the level of HAT plus 0.8 metres vertical elevation.

Except:

i. where the linear distance specified in 3b is less than 40 metres, in which case section 3a does not apply and the erosion prone area width will be the greater of 3b and 3c;

ii. where outcropping bedrock is present and no approved revetments exist, in which case the line is defined as being coincident with the most seaward bedrock outcrop at the plan position of present day HAT plus 0.8 metres; or

iii. in approved canals in which case the line of present day HAT applies, irrespective of the presence of approved revetments or outcropping bedrock.

The erosion prone area for Ipswich LGA is defined by 3a and 3c in the definition which relate the erosion prone area to the plan position of the level of highest astronomical tide plus sea level rise inundation.

3a, i.e. 40 metres landward of the plan position of HAT is likely to include properties and building footprints by default as matter of spatial anomaly rather than a 'true' coastal erosion risk.

It is therefore intended to analyse the percentage exposure of building footprints as proxy of risk to coastal erosion.

3.2 State Planning Policy



The *State Planning Policy, July 2017* (SPP) is a key component of Queensland's planning system and expresses the state's interests in land use planning and development. It includes the 'State interest – natural hazards, risk and resilience' which requires:

risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards.

The SPP provides the natural hazards, risk and resilience state interest under this theme, which is delivered via nine State interest policies.

It is important to note that State interest policy 8 states that in **erosion prone areas development does not occur unless the development cannot feasibly be located elsewhere** and is minor redevelopment of an existing permanent building or structure that cannot be relocated or abandoned.

Meridian Urban was engaged to undertake a Peer Review and Suitability Statement that examined Council's work to date in relation to natural hazard integration into the new planning scheme and provide comment on high-level compliance with relevant State interest policies under the SPP. The relevant State interest policies and their associated compliance can be summarised as follows:

Table 3-1. Relevant State interest policies

State interest policy (summarised)	Relevance to ICC
1 – Natural hazard areas are identified (i.e. mapped)	✓
2 – A fit-for-purpose risk assessment is undertaken	✓

3 – Avoidance of use of land for urban purposes in the erosion prone area	✓
4 – Development avoids natural hazard areas or mitigates risk to an acceptable or tolerable level	✓
5 – Development incorporates a range of risk reduction and resilience measures	✓
6 – Community infrastructure is located and designed to limit risk and maintain functionality	✓
7 – Coastal protection work is undertaken as a last resort in the erosion prone area	✓
8 – Development in erosion prone areas within the Coastal Management District is generally avoided unless it cannot feasibly be located elsewhere	✓
9 - Development in 8 above mitigates risk to an acceptable or tolerable level	✓

3.3 SPP guideline – Integrating state interests in a planning scheme

The SPP requires a risk assessment to inform the provisions of a planning scheme relating to the natural hazard risk. The risk assessment will help Council understand whether its planning intentions are appropriate, given the level of risk posed by the natural hazard. According to the SPP guideline (November 2021 version) a risk assessment should include the following three steps:

Step 1 – Hazard identification to address State interest policy 1

Step 2 – Risk analysis to address State interest policy 2

Step 3 - Risk response to address State interest policies 2 and 4.

This report relates to steps 1 and 2.

For urban areas, the SPP guidance recommends locally refined mapping of hazard areas based on localised storm tide and erosion prone area studies undertaken in accordance with the QLD government's Coastal hazard technical guide – determining coastal hazard areas. Once the map is prepared, a risk assessment for the hazard affected areas is to be undertaken. The risk assessment is expected to:

- identify land uses that are existing, proposed and should not occur in the hazard areas;
- develop risk criteria that consider the community's exposure, tolerability and vulnerability, and are used to identify a broadly acceptable, tolerable or intolerable level of risk for each land use; and
- identify suitable land-use strategies and planning provisions used to ensure that the community is not exposed to an intolerable level of risk.

The SPP guidance recommends undertaking an analysis of options that respond to the identified risks, either for the whole local government area or specific local areas at highest risk. The range of possible adaptation options broadly includes:

- regenerative options using beach nourishment, soft engineering and environmental restoration;

- engineering options with hard coastal structures structural options to improve human settlements resilience; and/or
- land use planning options.

When responding to risk, local governments can prepare specific land use planning responses that address mapped areas of high or imminent risk which are different to land use planning responses to other levels of risk elsewhere.

4 Phase 1 – Hazard identification

The State mapping for both medium / high hazard storm tide inundation area and the erosion prone area was used for the identification of coastal hazards. The coastal hazard areas within the Ipswich LGA were determined using the methodologies provided by the Coastal Hazard Technical Guide – Determining Coastal Hazard Areas (as discussed in **Section 3.1**)

Coastal hazard was identified in 11 out of Council's 30 Local Area Frameworks within either the storm tide inundation area or the erosion prone area, as seen in **Figures 5** to **7**, including:

- Local Area Framework 1 – Goodna, Gailes and Camira (part);
- Local Area Framework 6 – Redbank and Collingwood Park;
- Local Area Framework 8 – Riverview;
- Local Area Framework 9 – Bundamba, Blackstone, Ebbw Vale and Dinmore;
- Local Area Framework 10 – Karalee, Barellan Point and Chuwar;
- Local Area Framework 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket;
- Local Area Framework 12 – Brassall;
- Local Area Framework 13 – Ipswich, West Ipswich, Sadliers Crossing, Coalfalls and Woodend;
- Local Area Framework 14 – Basin Pocket, North Booval, Booval, Silkstone and East Ipswich
- Local Area Framework 15 – Raceview, Flinders View, Ipswich (part); and
- Local Area Framework – One Mile, Leichhardt and Wulkuraka (part).

The risk assessment analysis therefore focused on these 11 Local Area Frameworks.

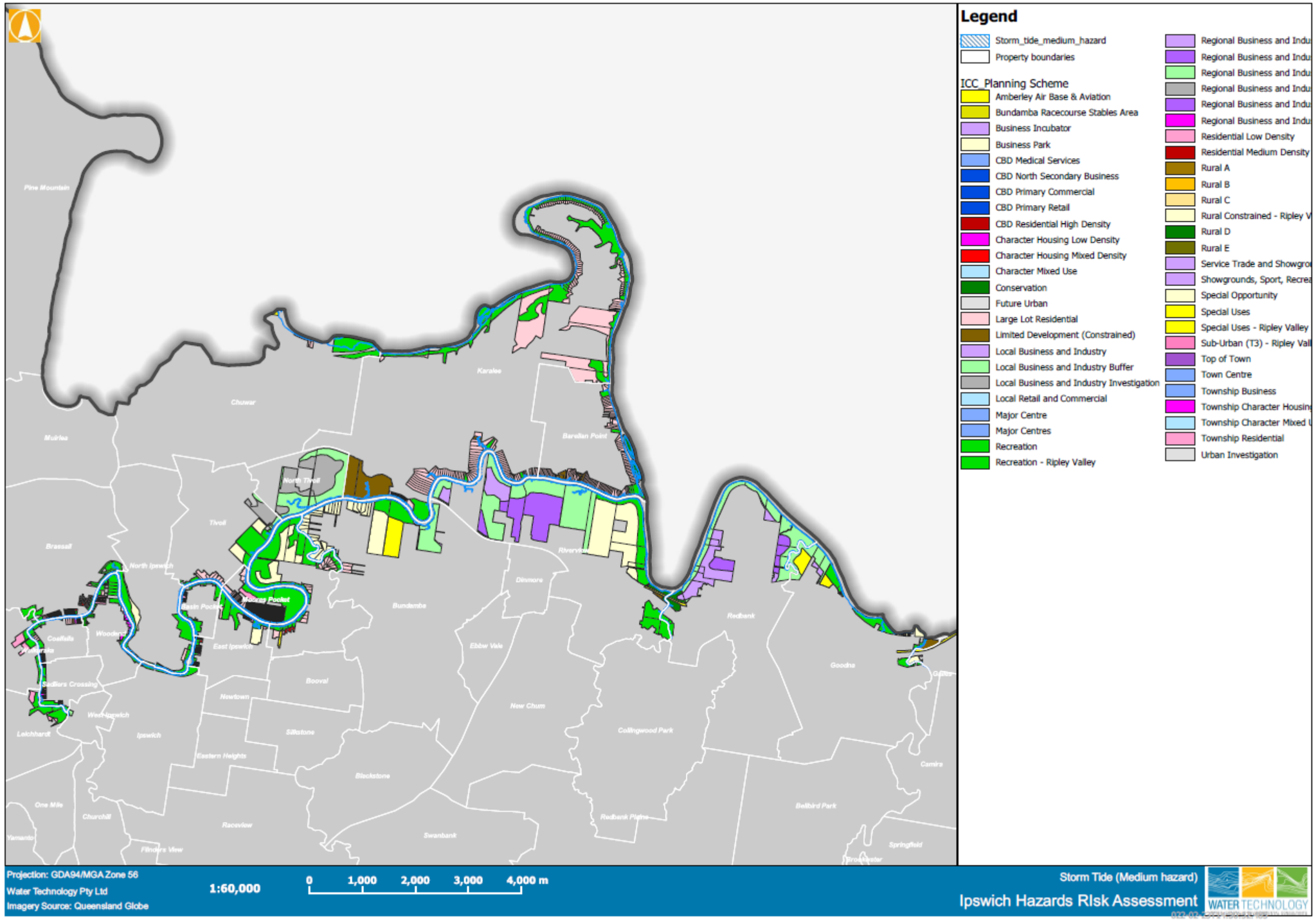


Figure 5. Storm tide (medium hazard) within the Ipswich LGA

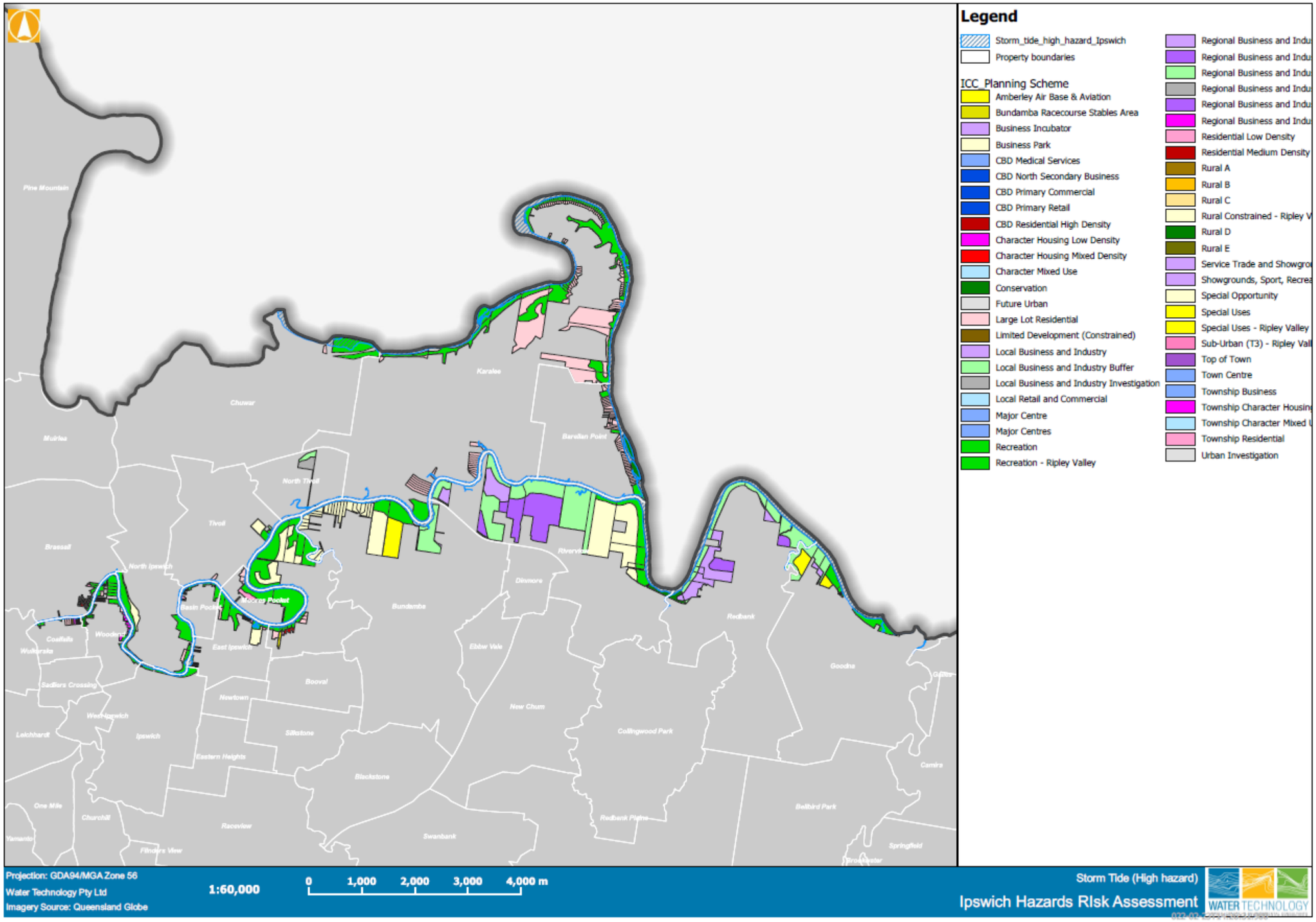


Figure 6. Storm tide (high hazard) within the Ipswich LGA

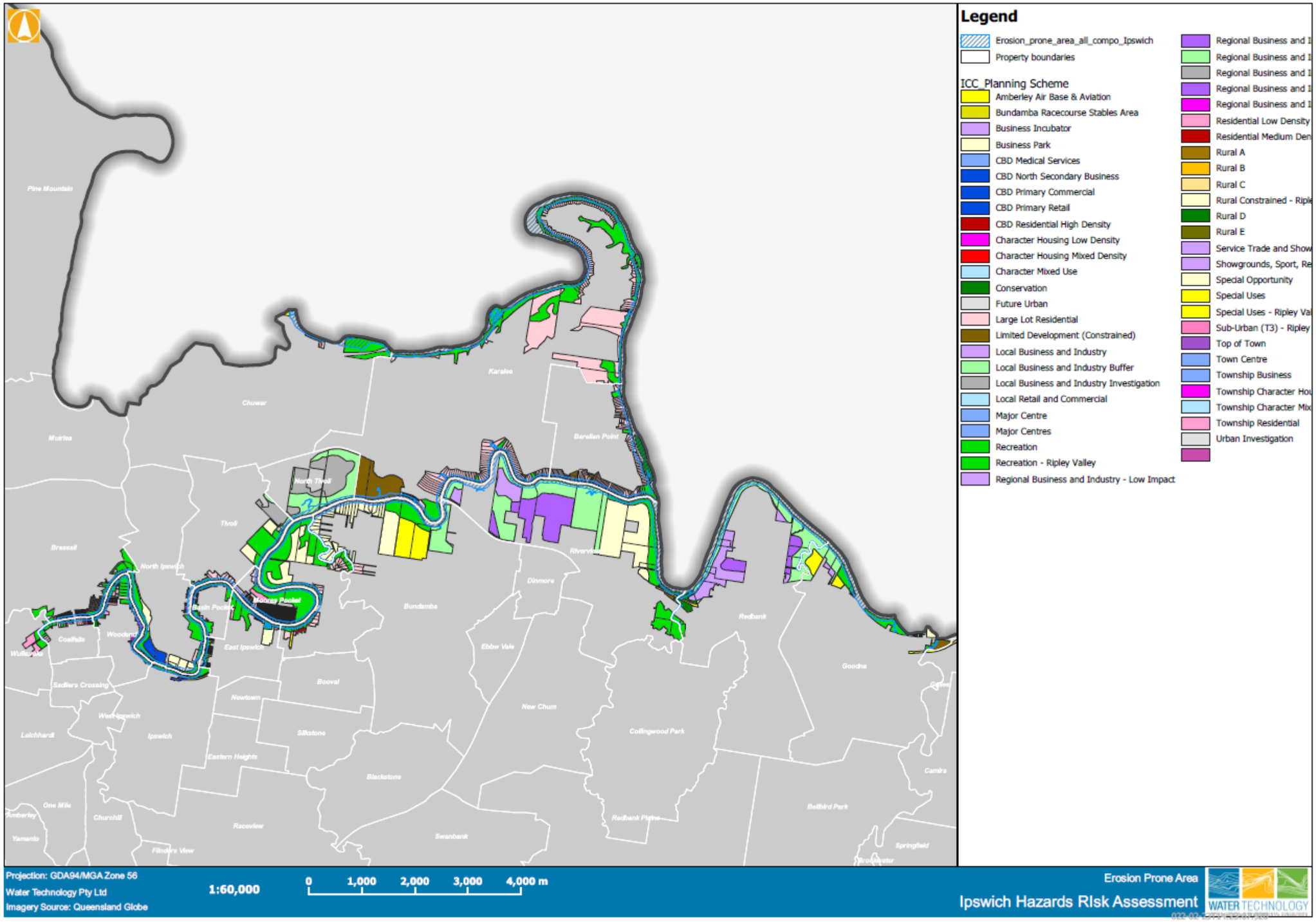


Figure 7. Erosion prone area within the Ipswich LGA

5 Phase 2 – Risk assessment

A high-level risk assessment in line with the SPP guidance on coastal hazards and the QCoast 2100 Minimum Standards and Guidelines was undertaken.

To provide a bespoke place-based approach to mitigating identified coastal hazard risk, the risk analysis has been undertaken using Local Area Framework boundaries. Using the property level database, current land use zoning categories and the coastal hazard 'extents' provided, a binary analysis of exposure and is summarised by individual local area below.

The property level database contains all building-scale information collated from Ipswich City Council and the datasets from the Department of Natural Resources and Mines. The database is often referred to as the Geovision data.

5.1 Exposure analysis and risk assessment

A pragmatic approach, combining site-specific considerations, existing information and data in conjunction with a desktop analysis has been used to identify exposure across the Local Area Frameworks.

Compliant with ISO 31000, Council is required to undertake a fit-for-purpose risk assessment which identifies and achieves an acceptable or tolerable level of risk. As a minimum Council must consider all land use zoning categories against the coastal hazard risk categories to put forward a risk-based approach to the planning scheme.

Risk is defined as a function of probability and consequence. Best practice consequence assessments consider economic damages to the built environment, the most sophisticated version of this model is given by stage-damage curves. These provide the damage that the asset is expected to incur in response to a range of inundation depths. The use of stage damage curves is dependent on a range of likelihood events to provide an average annual damage and an estimate of economic consequence that informs risk across the floodplain.

Because a probabilistic approach is unavailable across a range of design hazard events, exposure to erosion prone area will be used as a proxy for the gradation of risk across the LGA, where available.

As a minimum based on the exposure analysis, the risk assessment 'statement' will identify those areas of the LGA that are exposed to intolerable, tolerable or acceptable risk (**Table 5-1**), based on certain thresholds. These categories are defined with the SPP – State interest guideline for natural hazards, risk and resilience. The SPP defines the risk evaluation categories which are used for this fit for purpose risk assessment:

Table 5-1. Risk evaluation categories

Coastal hazard risk category	Tolerability	
Low	**Acceptable**	*An acceptable risk is a risk that, following an understanding of the likelihood and consequences, is sufficiently low to require no new treatments or actions to reduce risk further. Individuals and society can live with this risk without feeling the necessity to reduce the risk any further.*
Moderate	**Tolerable**	*A tolerable risk is a risk that, following an understanding of the likelihood and consequences, is low enough to allow the exposure to continue, and at the same time high enough to require new treatments or actions to reduce risk in the short to medium term. Society can live with*

		this risk but believes that, as much as is reasonably practical, steps should be taken to reduce the risk further.
High	**Intolerable**	*An intolerable risk is a risk that, following an understanding of the likelihood and consequences, is so high that it requires actions to avoid or reduce the risk. Individuals and society will not accept this risk and measures are to be put in place to reduce the risk to at least a tolerable level.*
Extreme	**Intolerable**	

5.1.1 Exposure by area

This section documents the results of the coastal hazard exposure analysis by Local Area Frameworks. As shown in **Table 5-2**, there is significant exposure to coastal hazard by mapped area (km²) in Karalee, Barellan Point and Chuwar, North Ipswich, Riverview and Booval, East Ipswich, North Booval.

The values presented in the table each equate to less than 0.1% of the total extent of the respective Local Area Frameworks. The extent of the erosion prone area for Karalee, Barellan Point, Chuwar is shown in **Figure 8**, as it can be seen the erosion prone area is only mapped on the fringes of properties along the banks of the Brisbane River and Bremer River.

Table 5-2 Exposure by mapped area (km²)

Local Area Framework	Coastal Management District		Erosion prone area		Storm tide inundation area (High)		Storm tide inundation area (Medium)	
	km²	%	km²	%	km²	%	km²	%
1 – Goodna, Gailes and Camira (part)	5.6	0	163.9	0	44.9	0	29.8	0
10 – Karalee, Barellan Point and Chuwar	**297.9**	**0**	**1032.7**	**0**	**249.6**	**0**	**129.8**	**0**
11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket	3.8	0	370	0.02	28.2	0.01	28.6	0
Area 12 – Brassall	0.1	0	55.6	0.01	1.6	0	4	0
13 – Ipswich, West Ipswich, Sadliers Crossing, Coalfalls and Woodend	2.8	0	113.1	0	4.2	0	18.1	0
14 – Basin Pocket, North Booval, Booval, Silkstone and East Ipswich	4.6	0	243.9	0.03	23.4	0	29.8	0
15 – Raceview, Flinders View, Ipswich (part)	21.8	0	125.4	0	22.7	0	18.3	0
21 – One Mile, Leichhardt and Wulkuraka (part)	0	0	0.2	0	0	0	5.2	0
6 – Redbank and Collingwood Park	2.9	0	202.3	0.01	23.1	0	17.5	0
8 – Riverview	6.9	0.01	251.5	0.04	27.7	0.01	22.9	0.01
9 – Bundamba, Blackstone, Ebbw Vale and Dinmore	4.6	0	97.5	0.01	7.7	0	8.3	0



Figure 8. Erosion Prone Area in Local Area Framework 10 – Karalee, Barellan Point, Chuwar

5.1.2 Land use activity

Table 5-3 presents property (lot) counts by land use activity exposure. As shown in the table, there are 346 Large Lot Residential properties and 96 Low Density Residential properties mapped in the erosion prone area.

Note, the erosion prone area is located spatially in the same location as storm tide inundation area and coastal management district, i.e., values in the table under storm tide inundation area and coastal management district are not additional properties.

Table 5-3 Exposure by Land Use Activity (properties)

Land Use Activity	Properties			
	Erosion prone area	Coastal management district	Storm tide inundation area (High)	Storm tide inundation area (Medium)
CBD North Secondary Business	2	0	0	0
CBD Primary Retail	1	1	1	1
CBD Residential High Density	2	2	1	2
Character Housing Low Density	24	14	11	23
Conservation	9	8	9	9
Large Lot Residential	346	104	313	326
Limited Development (Constrained)	16	1	13	14

Local Business and Industry	1	1	1	1
Local Business and Industry Buffer	7	4	6	8
Local Business and Industry Investigation	4	1	4	4
Recreation	219	138	186	213
Regional Business and Industry - Low Impact	5	5	5	5
Regional Business and Industry - Medium Impact	3	2	3	3
Regional Business and Industry Buffer	13	9	13	13
Residential Low Density	72	22	39	77
Residential Medium Density	5	2	1	2
Special Opportunity	59	31	48	49
Special Uses	8	1	6	7
Total	**796**	**346**	**660**	**757**

5.1.3 Building footprints

An analysis of building footprints available in the Geovision database provides a clearer picture of the exposure in the Ipswich LGA. **Table 5-4** and **Figure 9** shows the number of building footprints exposed to the erosion prone area, average percentage of exposure and the maximum percentage of building exposure.

- there are 18 building footprints exposed to erosion prone area in the Ipswich LGA;
- 12 buildings zoned as Large Lot Residential in Local Area Framework 10 – Karalee, Barellan Point and Chuwar:
    - the maximum percentage exposure is 43% and the average exposure is 16.6%;
- 4 buildings zoned as CBD North Secondary Business (3) and Special Opportunity (1) in Local Area Framework 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket (**Figure 10**):
    - the maximum exposure is 1%. The likely reason for the mapping of the buildings in North Ipswich is due to the corner of the spatial polygons coinciding, rather than a true coastal erosion risk to the building;
- 1 building zoned as Medium Density Residential in Brassall and 1 building zoned as Recreation in the Local Area Framework 1 – Goodna, Gailes, Camira (part).

In summary, the analysis of building footprints across the LGA shows the exposure to erosion prone area to be insignificant. Council may consider a focused land use planning response to properties and buildings in Local Area Framework 10 – Karalee, Barellan Point and Chuwar.

Table 5-4 Exposure by building footprint

Local Area Framework	Building footprints exposed	Average % in erosion prone area	Max % in erosion prone area	Land use activity
1 – Goodna, Gailes and Camira (part)	1	10	10	Recreation
10 – Karalee, Barellan Point and Chuwar	12	16.6	43	Large Lot Residential
11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket	4	0.25	1	Special Opportunity, CBD North, & Secondary Business
12 – Brassall	1	10	10	Medium Density Residential
13 – Ipswich, West Ipswich, Sadliers Crossing, Coalfalls and Woodend	-	-	-	-
14 – Basin Pocket, North Booval, Booval, Silkstone and East Ipswich	-	-	-	-
15 – Raceview, Flinders View, Ipswich (part)	-	-	-	-
21 – One Mile, Leichhardt and Wulkuraka (part)	-	-	-	-
6 – Redbank and Collingwood Park	-	-	-	-
8 – Riverview	-	-	-	-
9 – Bundamba, Blackstone, Ebbw Vale and Dinmore	-	-	-	-
Total building footprints	**18**	-	-	-

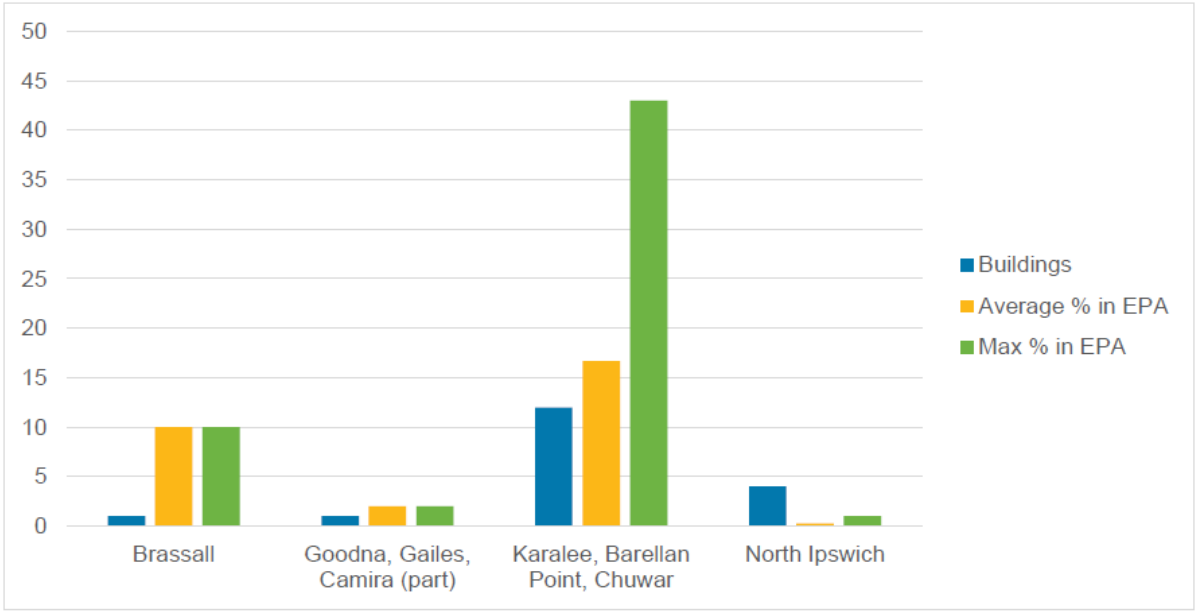


Figure 9. Building footprint exposure (% of footprint in mapped erosion prone area (EPA))

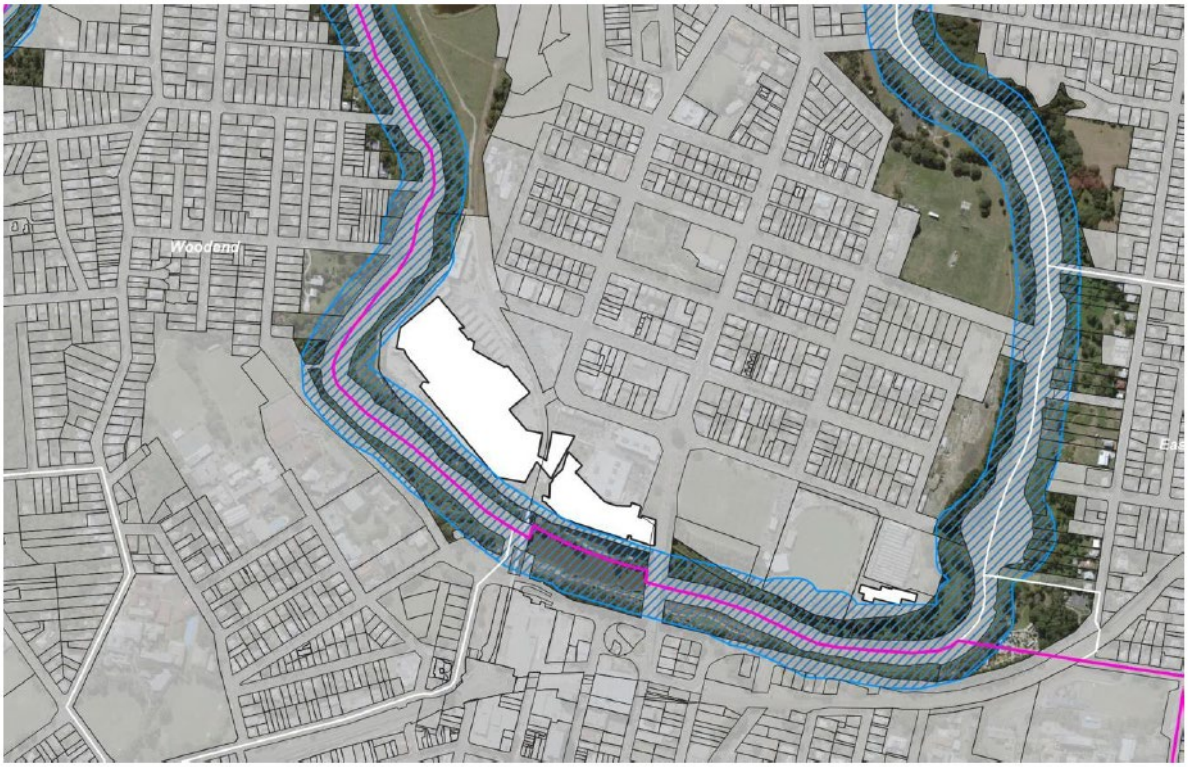


Figure 10. Local Area Framework 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket: Building footprint in mapped erosion prone area

5.1.4 Risk statement

A probabilistic approach is unavailable across a range of design hazard events, therefore exposure to erosion prone area will be used as a proxy for the gradation of risk across the LGA. The following **Table 5-5** provides a matrix of categories for the purpose of defining risk to coastal hazards across the LGA.

Table 5-5 Risk matrix

Building footprint exposure	0-9%	10-17%	17-25%	26-33%	>34%
Residential	Moderate	High	High	Extreme	Extreme
Commercial	Low	Moderate	Moderate	High	Extreme
Industrial	Low	Low	Moderate	Moderate	High
Other	Low	Low	Low	Moderate	Moderate

As a minimum based on the exposure analysis, this risk assessment statement identifies buildings across the LGA that are exposed to intolerable, tolerable or acceptable coastal hazard risk.

Table 5-6 provides a high level risk assessment of exposed buildings which may require a mitigation response. A total of 18 buildings have been identified, 13 of which are residential buildings. Local Area Framework 10 – Karalee, Barellan Point and Chuwar is the area with most building at an extreme or high risk category, all of which are residential buildings. There is also one residential building in Local Area Framework 12 – Brassall identified at high risk. There are four commercial buildings exposed in Local Area Framework 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket and one recreation building in Local Area Framework 1 – Goodna, Gailes, Camira (part), however their risks are low with an acceptable tolerability.

Table 5-6 High level risk assessment of exposed buildings

Property ID	Local Area Framework	Area m²	% in Erosion prone area	Land use category	Risk category	Tolerability
545032	10 – Karalee, Barellan Point and Chuwar	197	43	Residential	Extreme	Intolerable
692455	10 – Karalee, Barellan Point and Chuwar	258	41	Residential	Extreme	Intolerable
866118	10 – Karalee, Barellan Point and Chuwar	629	24	Residential	High	Tolerable
1774062	10 – Karalee, Barellan Point and Chuwar	105	23	Residential	High	Tolerable
2246823	10 – Karalee, Barellan Point and Chuwar	196	21	Residential	High	Tolerable
2240100	10 – Karalee, Barellan Point and Chuwar	262	15	Residential	High	Tolerable
1938135	10 – Karalee, Barellan Point and Chuwar	186	13	Residential	High	Tolerable
1028456	12 – Brassall	266	10	Residential	High	Tolerable
242593	10 – Karalee, Barellan Point and Chuwar	442	8	Residential	Moderate	Tolerable
1615744	10 – Karalee, Barellan Point and Chuwar	430	8	Residential	Moderate	Tolerable
76928	10 – Karalee, Barellan Point and Chuwar	108	3	Residential	Moderate	Tolerable
1616959	10 – Karalee, Barellan Point and Chuwar	4330	1	Residential	Moderate	Tolerable
531997	10 – Karalee, Barellan Point and Chuwar	270	0	Residential	Moderate	Tolerable
1028465	1 – Goodna, Gailes and Camira (part)	291	2	Recreation	Low	Acceptable
233476	11 – North Ipswich Tivoli, North Tivoli and Moores Pocket	275	1	Commercial	Low	Acceptable
70165	11 – North Ipswich Tivoli, North Tivoli and Moores Pocket	2405	0	Commercial	Low	Acceptable
1612311	11 – North Ipswich Tivoli, North Tivoli and Moores Pocket	14361	0	Commercial	Low	Acceptable
1771200	11 – North Ipswich...	45303	0	Commercial	Low	Acceptable

5.2 Policy and risk synthesis

The risk analysis reveals that the exposure to erosion and storm tide inundation is limited to the fringes of properties that line the Brisbane and Bremer Rivers. The dominant source of inundation hazard is likely to be from riverine flooding as it aligns with high flood hazard (Hydraulic Risk 1) area along the rivers.

Local Area Framework 10 – Karalee, Barellan Point and Chuwar has the most properties impacted, but it is only the fringes of the properties along the banks for the rivers. Only two properties are identified at intolerable risk which will require further assessment in the context of the riverine flooding risk (which will be finalised through our ongoing flood risk integration work with Council). It is therefore considered that land use policy or zoning changes are not necessary based on the levels of risk presented by either storm tide or erosion prone areas, other than for the two properties identified at intolerable risk.

When the exposure area is compared with Council's new planning scheme zones, majority of the area of hazard has already been mitigated by being zoned environmental management. This split zoning however is not consistently applied, there appears to be some patches in the Karalee area.

As riverine flooding is the highly dominant hazard over storm tide inundation, it is not recommended that storm tide inundation be mapped within the planning scheme to ensure no unintended conflict with the operation of MP3.5 of the QDC. Additional mitigation provisions for storm tide may still be included with the flooding mitigation provisions.

It is recommended that erosion prone areas still be mapped within the planning scheme (using the state layer) and development controls that achieve the relevant state interest policies of the SPP should be included in a related overlay code - such as the flood hazard overlay code or the watercourses and wetlands overlay code. This will strengthen the policy position of limiting development close to the waterway, given the requirement for only temporary or relocatable development within the erosion prone area.

In sum this risk assessment is considered to satisfy Policy 1 and Policy 2 of the SPP Natural Risk and Resilience – Coastal Hazards and should be used to inform planning instrument responses (in Policies 3 - 9).

6 Recommendations

This report provides an overview of coastal hazard exposure across the Ipswich LGA using available erosion prone area and storm tide inundation area mapping. The analysis reveals that the exposure is limited to the fringes of properties that line the Brisbane and Bremer Rivers. The dominant source of inundation hazard is likely to be from riverine flooding. Therefore, storm tide inundation risk is not considered significant to evoke a dedicated land use planning response.

The focus of the exposure analysis is predominantly on the erosion prone area, as the land mapped within this category is assumed to be lost should it be exposed to an erosion event.

The risk statement has converted the assigned risk category (i.e., low, moderate, high or extreme) into tolerability based on the current land use activity and planned land use activity of the current zoning pattern. The outputs of the high level risk statement can be used to inform land use planning responses to mitigate intolerable risks to a tolerable or acceptable level only and not to be used to justify intensification of 'Acceptable' risk areas. The areas considered to have acceptable risk is based on the current and future land use activity associated with the current zoning pattern.

This assessment is considered to satisfy Policy 1 and Policy 2 of the SPP Natural Risk and Resilience – Coastal Hazards and should be used to inform planning instrument responses (in Policies 3 - 9). The following recommendations are provided to inform the planning response and preparation of drafting recommendations for the new Ipswich planning scheme:

- land use policy or zoning changes are not considered necessary based on the levels of risk presented by either storm tide or erosion prone areas, other than for the 2 properties identified at intolerable risk in Local Area Framework10 – Karalee, Barellan Point and Chuwar;
- Council notes that the State interest policy 8 on Erosion prone areas within a coastal management district limits development unless the development cannot feasibly be located elsewhere and is minor redevelopment of an existing permanent building or structure that cannot be relocated or abandoned;
- Council be cognisant that if their new planning scheme maps storm tide inundation areas, then the building work MP3.5 trigger will no longer apply to those parts of the flood hazard area that are also then identified in the storm tide inundation area. This is because MP 3.5, which regulates the design and construction of buildings in designated flood hazard areas, does not apply on land subject to storm surge;
- as riverine flooding is the highly dominant hazard over storm tide inundation, it is not recommended that storm tide inundation be mapped within the planning scheme. This will also ensure no unintended conflict with the operation of MP3.5 of the QDC; and
- erosion prone areas should still be mapped within the planning scheme (using the state layer) and development controls that achieve the relevant state interest policies of the SPP should be included in a related overlay code, such as the flood hazard overlay code or the watercourses and wetlands overlay code. This will strengthen the policy position of limiting development close to the waterway, given the requirement for only temporary or relocatable development within the erosion prone area.

Meridian
Urban